IV. SITE DEVELOPMENT STANDARDS

A well-designed site results in cost-effective, safe, secure and visually appealing development. *The Design Standards* identify clear standards to achieve well-designed sites at the Laboratory.

This section reviews the major design levels in site development. First is site design - the selection of a site and the arrangement of improvements on that site. Second is design of the circulation - the connective systems that allow pedestrian and vehicular access and movement within the Laboratory and beyond.

Third is landscape design - the detailed site improvements that humanize a site. All three levels require careful integration during the design process to create a distinct sense of place and a world-class environment for the Laboratory.

A. SITE DESIGN

1. Site Selection
2. Site Analysis
3. Energy and Water
4. Urban Open Space

B. CIRCULATION

1. Vehicular/Road System
2. Parking System
3. Transit System
4. Pedestrian & Bicycle Systems

C. LANDSCAPE ELEMENTS

1. Site Furniture
2. Signage
3. Barriers
4. Lighting
5. Paving
6. Planting

1. Using This Document Section

The intent of *Site Development Standards* is to reinforce and supplement the Los Alamos National Laboratory Engineering Stanards Manual. Every construction project shall incorporate the design standards set forth in this document. As projects use and implement these standards, Los Alamos National Laboratory will incrementally achieve a more cohesive, efficient amd attracive environment.

To use this document, follow these steps:

1) Compare project scope to document map at right *(Figure XXX)* to determine applicable sections.
2) Locate project site on key map on following pages (*Figures XXX* through *XXX*) to determine if site is a '*center*' or an *'edge'* zone.
3) Make a copy of the checklists on immediately following pages. Each also repeated at the beginning of the subject sections.
4) Use the checklist copies to track which standards need to be incorporated into the project programming.
5) Refer to applicable sections for further explanation of design standards and best practices.

Figure XXX: Document Map

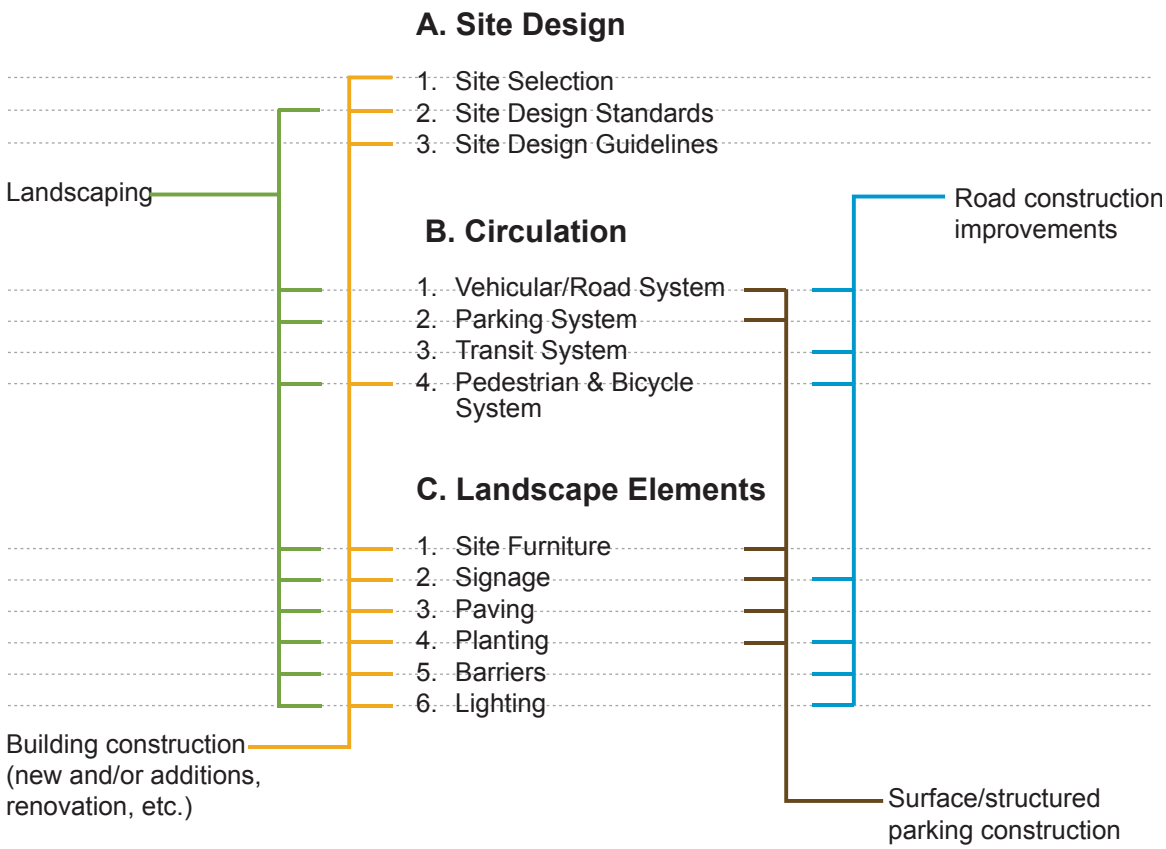
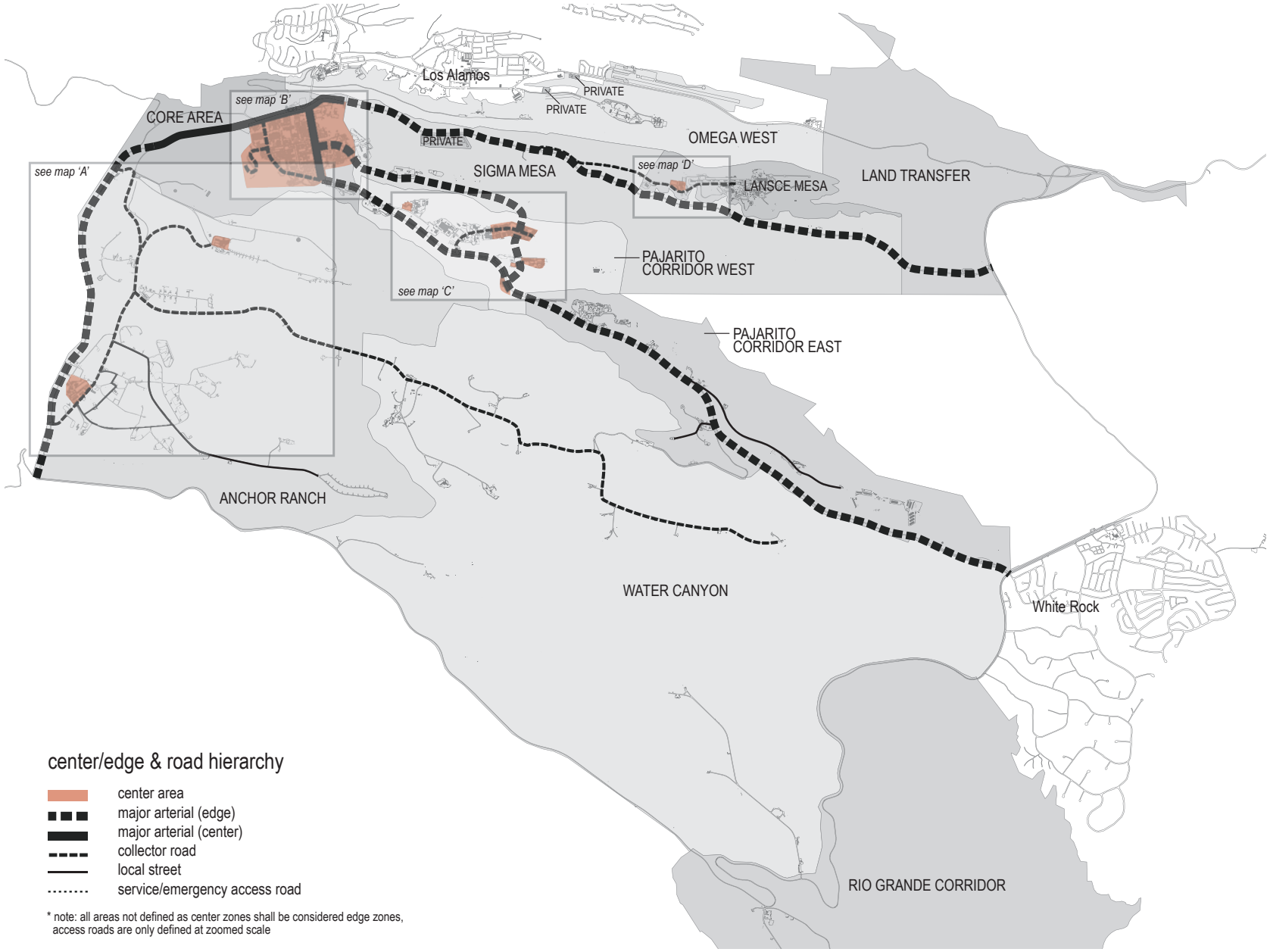


Figure XXX: Center/Edge and Road Hierarchy Key Map



2. Centers and Edges

Site Development Standards are based on being in one of two development zones: center or edge. Each development zone is defined by its location, public visibility, and security requirements *(See Figure XXX)*. Refer to *Figures XXX - XXX* to determine if a site is within a center zone. All other laboratory areas are considered edge zones.

Center Zones
Center zones are characterized by dense concentrations of buildings, heavy traffic volumes and diversity of activities.

Edge Zones
Edge zones are the remaining, less developed areas of the Laboratory. These zones are usually less populated, more isolated locations and closely surrounded by the natural environment.

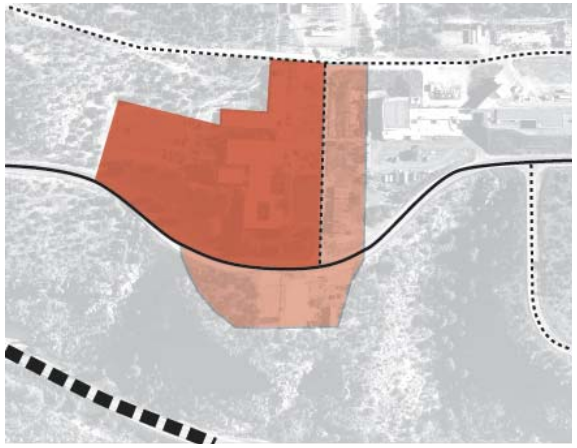
Future Adjustments
Future adjustments to the "center" and "edge" designations will need to be made to accommodate development needs. Updates to the centers and edges maps shall be made periodically by Long-Range Planning .

Figure XXX: - Map 'A' Anchor Ranch Planning Area

Figure XXX: Map "B' - Pajarito West Corridor Planning Area

Figure XXX: Map 'C' - Core Planning Area

Figure XXX: Map 'D' - Lansce Planning Area



center/edge & road hierarchy

- center area | intermediate area
- card access gate
- security gate or checkpoint
- major arterial (edge)
- major arterial (center)
- collector road
- local street
- service/emergency access road
- shuttle stops

* note: all areas not defined as center zones shall be considered edge zones, access roads are only defined at zoomed scale

3. The Check Lists

The following checklists are to be used in the initial siting, planning, and detailed design of development at Los Alamos National Laboratory. The purpose is to incorporate major development issues that affect site design in the project definition phase so that appropriate scopes and budgets are considered from the on-set of the project

Early inclusion of the issues in the check lists will help to reinforce the Laboratory's overarching development goal to create a more effcient, modernized, environmentally sound, and aesthetically pleasing work environment.

Using the checklists:

1. Make copies of the following checklist pages.

2. Review each item on the checklist and the related detail information sections in the document.

3. Check mark items that need to be included in the project planning and design.

4. Submit the marked checklists in the initial project siting requests to _____.

A. Site Design:

This matrix sets guidelines for selecting a site for a projecct.
See _____for detailed informatiom on selection guidelines.

Table XXX: Site Selection Standards

A.1 Site Design / Site Selection		
STANDARD	**DESCRIPTION**	**ALTERNATE**
a. ☐	IF there are Imperiled Species and/or Ecological Communities, See NCB Compliance in Engineering Standards.	
b. ☐	IF there are Floodplains, Wetlands and/or Water Bodies, See NCB Compliance in Engineering Standards.	
c. ☐	IF there are Historic Structures (over 50 years old) and/or Archaeological Sites, See NCB Compliance in Engineering Standards.	
d. ☐	No construction on slopes over 15%.	
e. ☐	Existing road infrastucture must be present within 1200 feet.	
f. ☐	☐ Existing water and sewer lines within 1200 feet. ☐ Existing gas line within 1200 feet. ☐ Existing electric line within 1200 feet.	Use on-site renewable energy source (solar, wind, geo-thermal).
g. ☐	Conforms to CSP, ADP's and Specific Area Master Plans for project location	

Table XXX: Site Design Standards

A.2 Site Design / Site Analysis

STANDARD	DESCRIPTION	ALTERNATE
a. ☐	Conduct Site Analysis (Create Summary Map or Series of Maps)	
	☐ Topography and Slope	
	☐ Soil Types	
	☐ Vegetative Cover	
	☐ Geologic and Seismic Data	
	☐ Existing Land Uses	
	☐ Existing Buildings and Structures	
	☐ Existing Utility Easments or Corridors	
	☐ Existing Utility Lines and Sizes	
	☐ Existing Road System	
	☐ Existing Parking Network	
	☐ Existing Pedestrian and Bicycle Networks	
	☐ Existing Transit Network	
	☐ Existing Security Zones	
	☐ Existing Safety Zones and Buffers	
b. ☐	Develop fire management zones concept (ZONE 1, 2 and 4)	
c. ☐	Apply flood threat reduction strategies	
d. ☐	Develop erosion control and water quality management plan	
e. ☐	Identify if safety hazard zones required and meet safety requirements if needed	
f. ☐	Reuse brownfiield site and remediate as needed	
g. ☐	Identify and meet project security requirements, See Integrated Safeguards and Security Management.	
h. ☐	Identify existing or proposed utility cooridors and design utilities to use	

Table XXX: Site Design Guidelines

A.3 Site Design / Energy and Water

GUIDELINES	DESCRIPTION	ALTERNATE
a. ☐	Utilize solar orientation	
b. ☐	Utilize passive heating or cooling technologies	
c. ☐	Generate on-site power (bio-generation, photovoltaics, wind, geo-thermal)	
d. ☐	Use renewable energy sources	
e. ☐	Incorporate water harvesting strategy	
f. ☐	Implement water quality requirements	
g. ☐	Reuse treated greywater on-site	

Table XXX continued: Site Design Standards

A.4 Site Design / Urban Open Space		
STANDARD	**DESCRIPTION**	**ALTERNATE**
a. ☐	Plaza if noted in Area Development Plan or Specific Master Plan for project area	
b. ☐	Provide Entrance Area to every occupied building	
	☐ Minimum 6' wide accessible walk to main entry of building	
	☐ 10 sq.ft. hardscape per occupant (min. 500 sq.ft.)	
	☐ 2 Benches	
	☐ 1 trash receptacle	
	☐ 1 Cigarette Receptacle	
	☐ 1 bike rack (3 bike) per 25 occupants (min. 1)	
☐	10 sq. ft. of Planting Area per occupant (min. 500 sq.ft.)	
c.	Provide Outdoor Seating/Break/Smoking Area to occupied buildings with 25 people or more	
	☐ 10 sq.ft. hardscape per occupant (min. 500 sq.ft.)	
	☐ 2 Benches per 25 occupants	
	☐ 1 trash receptacle per 25 occupants	
	☐ 1 Cigarette Receptacle per 50 occupants	
☐	10 sq. ft. of Planting Area per occupant (min. 500 sq.ft.)	
d. ☐	Meet ADA and UFAS Accessibility Standards	
e. ☐	Provide paved safe access with emergency walkway or trail to emergency exits	
f.	Identify emergency refuge area defined by ESH (can be entry or outdoor seating area)	

B. Circulation:

This matrix sets guidelines for roads, transit, pedestruan, bicycle and parking systems for a project. See _____for detailed informatiom on selection guidelines.

Table XXX: Circulation/Road Standards

B.1 Circulation / Road System

STANDARD	ROAD TYPE	CENTER	EDGE	DESCRIPTION	LANDSCAPE REQUIREMENT
a. ☐	Major Arterial - Edge		X	- 4 lanes, 12' each, median optional - 15' min. corner radius - 100'-120' road easement with bike lane or path - 6' min. sidewalk or trail on one side	*See Figure XXX*
b. ☐	Major Arterial - Center	X		- 4 lanes, 12' each with 16' median - 15' min. corner radius - 100'-120' road easement with bike lane or path - 6' min. sidewalk on both sides	*See Figure XXX*
c. ☐	Collector-Transit	X		- 2 - 4 lanes, 12' each, median at intersections - 15' min. corner radius - 60'- 80' road easement with bike lane - 6' min. sidewalk on both sides	*See Figure XXX*
d. ☐	Collector	X	X	- 2 lanes, 12' each, no median, 15' corner radius - 60'- 80' road easement with bike path or bike lane - 6' min. sidewalk on one side	*See Figure XXX*
e. ☐	Local Street	X	X	- 2 lanes, 11' each, no median, 10'-12' corner radius - 50' road easement - 6' min. sidewalk on both sides	Dependent on center on edge location
f. ☐	Service-Emergency Access	X	X	- 1 - 2 lanes, 12' each - 20' road easement, no bike lane	None

Table XXX: Parking Standards

B.2 Circulation / Parking System

STANDARD	PARKING ELEMENT	CENTER	EDGE	DESCRIPTION	REQUIREMENT
a. ☐	Surface Parking	X	X	☐ Large parking lot ☐ Small parking lot ☐ Service area	*See Figure XXX* *See Figure XXX* *See Figure XXX*
b. ☐	Parking Structures	X			none
c. ☐	Parking Stalls # _____of staff x 0.75 = Total stalls required	X	X	☐ Handicap stalls #_____ ☐ Employee stalls #_____ ☐ Government stalls #_____ ☐ Visitor stalls #_____ ☐ Service stalls #_____ ☐ Motorcyle stalls #_____ ☐ Bicycle stalls #_____ ☐ Van spaces #_____-___ 90 degree stall dimensions _____x_____ 60 degree stall dimensions _____x_____	*See Table XXX* *See Table XXX* *See Table XXX* *See Table XXX* *See Table XXX* *See Table XXX* *See Table XXX* *See Table XXX* *See Table XXX* *See Table XXX*
d. ☐	Parking - runoff control	X	X	Provide as directed by Engineering Standards Manual	
e. ☐	Parking - snow storage	X	X	Provide as directed by Engineering Standards Manua	
f. ☐	Parking - transit stop	X	X	Provide as directed by Engineering Standards Manua	

Table XXX: Transit Standards

B.3 Circulation / Transit System

STANDARD		CENTER	EDGE	DESCRIPTION	LANDSCAPE REQUIREMENT
a. ☐	Transit System	X	X	☐ Regional transfer station ☐ Transit stop ☐ Shuttle-handicapped drop-off	As per adjacent streetscape As per adjacent streetscape As per adjacent streetscape

Table XXX: Transit Standards

B.4 Circulation / Pedestrian and Bicycle Systems

STANDARDS	CIRCULATION SYSTEM	CENTER	EDGE	DESCRIPTION	LANDSCAPE REQUIREMENTS
a. ☐	Multi-Modal Path System	X		min. 12' wide paved (see landscape elements) physically separated from vehicular traffic	
b. ☐	Bicycle System	X	X	☐ **Class 1 - Path:** min. 10' wide, paved, physically separated from vehicular and pedestrian traffic ☐ **Class 2 - Lane:** min. 6' wide, separated from vehicular traffic by striping ☐ **Class 3 - Route:** designated and marked with signage	*See Figure XXX* *See Figure XXX* *See Figure XXX*
c. ☐	Pedestrian Systems	X	X	☐ **Primary walkways or corridors** 12' - 20' wide, paved ☐ **Secondary walkway or corridors** min. 10' wide, paved ☐ **Sidewalk** min. 6' wide, paved	See Figure XXX See Figure XXX See Figure XXX
d. ☐	Trails	X	X	min. 6' wide	

C. Landscape Elements:

This matrix sets guidelines for. landscape elements.
See _____for more detailed information.

Table IV-7: Site Furniture Standards

C.1 Landscape Element / Site Furniture					
STAN-DARD	FURNISHING TYPE	CENTER	EDGE	DESCRIPTION	PRE-APPROVED MANUFACTURER
a.1. ☐	Benches - metal 	x	x	min. 5 foot length steel, min. 90% recyled content silver backed with armrest	Landscape Forms: Petoskey Bench
a.2. ☐	Benches - recycled plastics 		x	min. 5 foot length recycled plastic, min. 95% recycled color: grey plastic member on chair	Landscape Forms: Balustrade Bench
b.1 ☐	Tables - metal 	x	x	steel, min. 90% recycled content silver	Landscape Forms: Carousel Table
b.2 ☐	Tables - recycled plastics 		x	recycled plastic, min. 95% recycled content grey	Landscape Forms: Gretchen Picnic Table

Table IV-8: Site Furnishings Standards

C.1 Landscape Element / Site Furniture (Continued)

STANDARD	FURNISHING TYPE	CENTER	EDGE	DESCRIPTION	PRE-APPROVED MANUFACTURER
c. ☐	Trash Receptacles - metal 	x	x	- steel - min. 86% recycled content - powder coated, silver color - minimum 30 gallon capacity	Landscape Forms: Petoskey Trash Receptacle
d. ☐	Trash Receptacles - plastic 		x	- recycled plastic - min. 38% recycled - grey color - minimum 30 gallon capacity	Landscape Forms: Gretchen Trash Receptacle
e. ☐	Cigarette Receptacles 	x	x	- steel - 95% recycled content - powder coated, silver color - pole mounted style	Forms + Surfaces: Buttler Ash Receptacle
f. ☐	Bike Racks 	x	x	- stainless steel - 65% recycled content - powder coated, silver color	Landscape Forms: Flo Bike Rack
g. ☐	Transit Shelters 	x	x	- segmented arc roof - metal support structure - transparent or opaque side panels - powder coated metal support - galvanized steel room	Fabricated to meet project size and scale needs.

Table IV-8: Signage Standards

C.2 Landscape Element / Signage

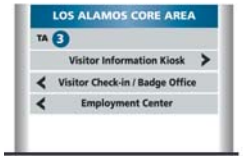
STANDARD	SIGNAGE TYPE	CENTER	EDGE	DESCRIPTION	LOCATION
a. ☐	 Identification	X	X	☐ Laboratory entry identification ☐ Planning area identification ☐ Tech area identification ☐ Building or structure ☐ Operation or division identification	Entries (Obtain complete signage series from _____)
b. ☐	 Directional	X	X	☐ Directional, Major Roadway ☐ Directional, Interior Roadway	Roadway (Obtain complete signage series from _____)
c. ☐	 Regulatory	X	X	☐ Traffic control ☐ Safety and Security	Varies (Obtain complete signage series from _____)
d. ☐	 Interpretive	X	X	☐ Pedestrian / Trail / Bicycle ☐ Visitor ☐ Public Transit	Varies (Obtain complete signage series from _____)

Table IV-9: Barrier Standards

C.3 Landscape Element / Barriers

STANDARD	BARRIER TYPE	CENTER	EDGE	DESCRIPTION	PRE-APPROVED MANUFACTURERS
a. ☐	Steel Fence / Gate 	X	X	steel fencing vertical picts color black or silver, low voc paint approved security height	*Ametco Fence Systems:* Stadium, Metro or Lattice Design (determined by security needs) *Ameristar:* Impasse High Security (when high security, anti-ram, anti-climb is required)
b. ☐	Welded Wire Fence / Gate 		X	2 “ dia. posts and rails galvanized ____gauge fabric concrete post footings approved security height	*Ametco Fence Systems:* Amopanel or Fiesta Design (determined by security needs)
c. ☐	Steel Bollard 	X	X	steel construction color black or silver approved security style	*Landscape Forms:* *Annapolis Bollard*
d. ☐	Wall 	X	X	concrete cast-in-place or masonry wall color match structures approved security height	*N/A*
e. ☐	Jersey Barrier 		X	manufactured concrete barrier colored to match buildings provided by local supplier	*N/A*
f. ☐	Landforms 	X	X	landscape appropriate for zone with permanent irrigation	*N/A*

Table IV-10: Exterior Lighting Fixtures Standards

C.4 Landscape Element / Exterior Light Fixtures

STANDARD	FIXTURE TYPE	CENTER	EDGE	DESCRIPTION	PRE-APPROVED MANUFACTURERS
a. ☐	General Area Lighting	x	x	night skies compliant fixture high pressure sodium aluminium pole color: silver	Architectural Area Lighting Model Line: Mitre (model based on specific project needs)
b. ☐	Parking Lighting	x	x	night skies compliant fixture high pressure sodium aluminium pole color: silver	Architectural Area Lighting Model Line: Mitre (model based on specific project needs)
c. ☐	Pedestrian Pole Lighting	x	x	night skies compliant fixture fluorescent lamp aluminium pole color: silver	Architectural Area Lighting Model Line: Mitre (model based on specific project needs)
d. ☐	Security Lighting	x	x	night skies compliant fixture aluminium pole color: silver	Based on specific project security needs

Table IV-11: Paving Standards

C.5 Landscape Element / Pavement

STANDARD	TYPE	CENTER	EDGE	DESCRIPTION	PRE-APPROVED MATERIALS
a. ☐	Paving Outdoor Break Areas	X	X	Provide outdoor paved area for sitting or picnic area: Min. of 100 sq.ft. for each 3000 sq.ft. of occupied building (min. 100 sq.ft., max 500 sq.ft.)	Concrete, precast interlocking concrete pavers
b. ☐	Paving Sidewalks	X	X	Provide min. 6' walks site-wide Provide min. 10' walks leading to main doors	Concrete, brick, precast interlocking concrete pavers
c. ☐	Paving Specialty	X	X	Use special paving in parking areas and service access areas where traffic is less than 25 cars/ day and permeable surfaces are necessary	Pre-cast Interlocking concrete pavers
d. ☐	Paving Trails	X	X	Provide min. 3' trails site-wide	Decomposed granite, gravel pave, compacted soil with binder. Bark mulch or stablized gravel can be used in remote locations where accessibility is not required.

Table IV-12: Planting Standards

C.6 Landscape Element / Planting

STANDARD	TYPE	CENTER	EDGE	DESCRIPTION	PLANT SELECTION
a. ☐	Planting / Buildings	x	x	Minimum of three (3) 2” caliper trees for every 3000 sq. ft. of related building (min. one (1) tree)	From plant list for applicable zone, *center or edge*
b. ☐	Planting / Roadways	x	x	Minimum as required in roadway standards	From plant list for applicable zone, *center or edge*
c. ☐	Planting / Parking lots	x	x	Minimum one (1) 2” caliper tree per every ten stalls	From plant list for applicable zone, *center or edge*
d. ☐	Planting / Revegetation	x	x	All areas disturbed by construction	From revegetation plant list
e. ☐	Mulches	x	x	3” minimum depth gravel mulch in fire-safety areas 2” pecan hull mulch in planter beds in non-fire safety areas	NA
f. ☐	Water Harvesting	x	x	passive systems such as pumice wicks and parallel swales (see text and images)	NA
g. ☐	Irrigation	x	x	Permanent automated system low flow design-drip irrigation water sensor	NA

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Site Selection

Proper site selection ensures that a new development is placed in the most appropriate location to align with Laboratory planning goals to protect the environment and cultural resources, and efficiently use infrastructure.

This section provides detailed information for:

Table XXX,
A.1 Site Design/ Site Selection
Imperiled Species
Floodplains
Historic
Slopes over 15%
Road Infrastructure
Utility Infrastructure
Institutional Plans

A. SITE DESIGN

Introduction

Site design incorporates land use, circulation, infrastructure, security, safety and environmental, cultural and quality issues into a project program. The site design process must be thorough and complete as it directly affects the cost, function and aesthetics of development.

Applying the guidance in this section will create sites that are better designed, functional and safer for visitors and Laboratory staff.

Principles

Principles for the Laboratory siting process are:

- Implement the land use goals in the Comprehensive Site Plan, Area Development Plans and Specific Area Master Plans.
- Use a consistent and complete site analysis and siting process for all development projects.
- Efficiently use existing land and infrastructure to improve the organization and function of the Laboratory.
- Use developable areas within and adjacent to existing development to take advantage of existing infrastructure.
- Incorporate security, safety and environmental and cultural requirements at the earliest stages of project development and siting.
- Identify and use utility corridors.

References

Other Laboratory and industry documents to be referenced are as follows:

CSP 2000
Comprehensive Site Plan 2000 and supplement
CSP 2001

ADP
Area Development Plans

SSSP
Site Safeguards and Security Plan

SS LIR
406.00.01.0 General Security
406.00.020 Classified Security
406.00.030 Nuclear Safeguards

DOE
Design Basis Threat Policy Document
Publication SAND 87-1926
Publication SAND 87-1926/2 Access Delay
Technology Transfer Manual, Volumes I and II
DOE 64.30.1A
DOE M5632.1C-1

LIR 220-01-01.4
Construction Project Management LIR

LIR 210-01-01.0
Site Planning LIR

1. Site Selection

a. Imperiled Species and Ecological Communities

As steward of 40 square miles of beautiful New Mexican environment, the Laboratory is committed to protecting the natural environment and mitigating development impacts on the natural resources of the site. Protecting existing imperiled species and their habitat is a top priority when selecting and designing a site, thus:

If imperiled species or habitat exists on a site, refer to NCB Compliance in Engineering Stanadards.

Where existing imperiled species or habitat (such as a threatened or endangered species, *See Figure XXX*) on a site proposed for development, the Environmental, Safety and Health (ESH) division will develop project specific mitigation, protection and/or management plans to be incorporated into the project program.

When siting, designing and constructing new roads, identify the need for wildlife underpasses to minimize accidents between wildlife and vehicles. Consult with the Laboratory's ESH division on the type of underpass and placement.

In order to maintain a healthy natural environment, the entire ecosystem needs to be considered. Ecological communities are sensitive systems that require careful protection and management when developing and designing sites. These systems are composed of plant and animal life that rely on each other to function as a biodiverse community.

A protection and management plan for ecological communities includes:

- an inventory of existing plant and amimal communities
- an understanding of important migration patterns and routes
- preservation of sensitve and crucial habitat areas and migration routes
- buffer zones between important habitat and development
- water quality and wetland protection
- erosion control

A comprehensive strategy, however, is the most effective way to ensure natural resources at the Laboratory are protected and improved.

Figure XXX: Endangered Species - Spotted Owl

b. Floodplains, Wetlands, and/or Water Bodies

Floodplains, wetlands, and water bodies should always be considered sensitive and crucial habitat. In addition, they are imperative to protect in terms of water quality, thus:

If floodplains, wetlands and/or waterbodies exist on a site, refer to NCB Compliance in Engineering Standards.

Where floodplains, wetlands or water bodies areas are identified on a site proposed for development, ESH will develop specific mitigation, protection and/or management plans to be incorporated into the project program.

Image XXX: Wetlands

c. Historic Structures (over 50 years old) and/or Archaeological Sites

Historic structures (over 50 years old) and archaeological sites are irreplaceable resources that should be preserved when possible. If any such structures or sites are discovered on a site, they shall be evaluated by *XXXX* to determine if they are considered cultural resources.

If cultural resources exist on a site, refer to NCB Compliance in Engineering Standards.

Once cultural resources are identified on a site proposed for development, ESH will develop specific mitigation, protection and/or management plans to be incorporated into the project program.

Figure XXX: Cultural Resources - Omega Bridge

d. Slopes over 15%

Disturbing or building on slopes over 15% causes excessive erosion leading to water quality issues, reduced rain water infiltration and disturbed wildlife habitat. In addition, construction costs are higher than building on flatter ground, thus:

No buildings are permitted on slopes greater than 15%.

Beyond avoiding slopes over 15%, sites should designed so that minimum site disturbane occurs. Sites should be graded to:

- Balance their cut and fill to within 10% unless there are extenuating circumstances related to the site or building use.
- Provide positive drainage away from structures.
- Maintain on-site road grades that do not exceed 8%.
- Limit retaining walls to a maximum height of 6 feet *(Figure XXX).*

Buildings on sloped sites should:

- Berm into the slopes where practical to reduce the buildings visual impact.
- Step the building's massing to follow the site's slope.

Site grading should avoid:

- Fill slopes of greater than 3:1.
- Cut slopes of greater than 2:1.
- Continuous fill or cut slopes of longer than 20 feet.
- Abrupt grading changes at the bottom or top of slope *(Figure XXX).*

Figure XXX : Slope Grades And Retaining Walls

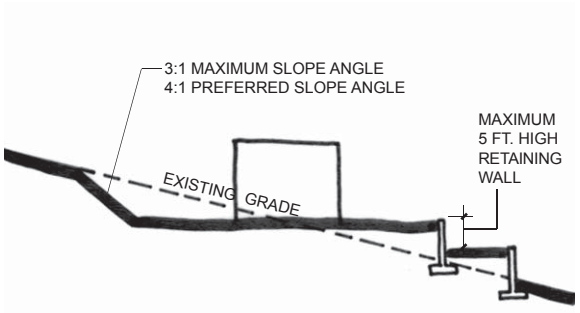
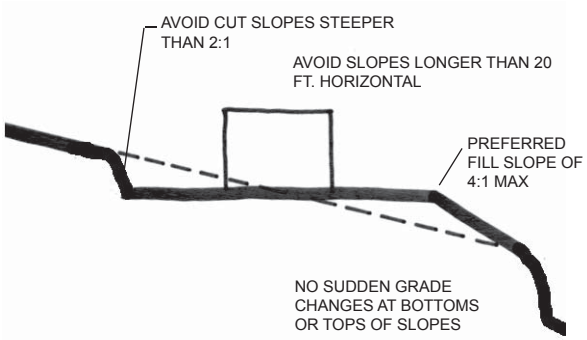


Figure XXX: Grading Problems



e. Road Infrastructure

It a goal of the Laboratory to have an efficient infrastructure system. Roads in particular are expensive to build, cause damage to habitat and wildlife migration and contribute to impermeable surfaces and heat generation. In addition, shorter road distances reduce driving time and gasoline usage. Due to these many factors, the shortest routes practical should always be considered foremost for new roads. In addition, shorter road distances reduce driving time and gasoline usage. Thus, when selecting a site:

Existing road infrastructure must be within 1200 feet of the proposed site.

f.g.h. Water, Sewer, Gas and Electric Infrastructure

Infrastructure efficiency is cost effective and conserves resources. This is especially true of water, sewer, gas and electric infrastructure, thus:

Existing water and sewer lines must be within 1200 feet of the proposed site.

Existing gas lines must be within 1200 feet of the proposed site.

Existing electric lines must be within 1200 feet of the proposed site.

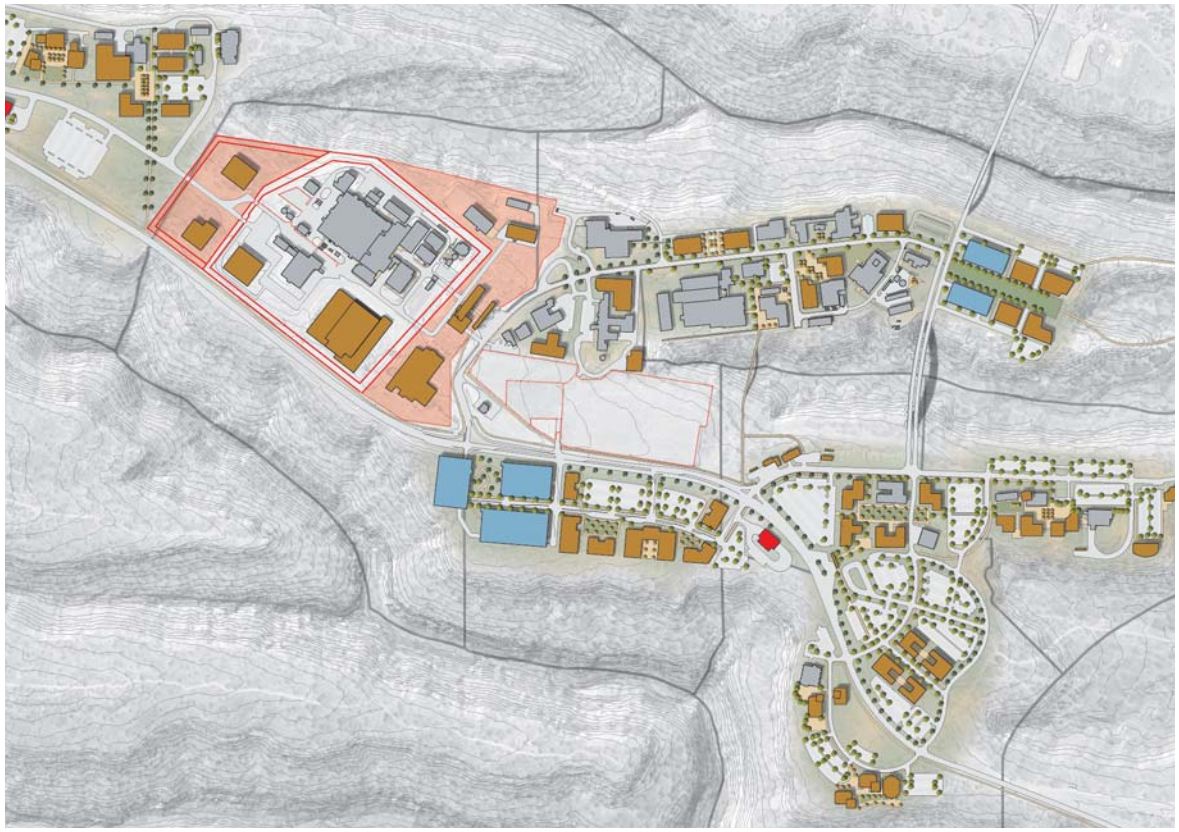
Under some circumstance, remote sites are needed for unique uses. In these cases, on-site renewable energy sources such as solar, wind or geo-thermal can be used to avoid the 1200 foot requirement for gas and electric lines.

i. Coordination with Existing Institutional Plans

The Comprehensive Site Plan (CSP) for the Laboratory, as well as Area Development Plans (ADPs) *(Figure XXX)* and Specific Area Master Plans have been developed to integrate programatic needs with physical factors to further the Laboratory's mission goals and objectives. Thus:

New sites must conform to relevant CSP, ADP's and Specific Area Master Plans.

Figure XXX: Example Plan



Site Analysis

Once a site is selected, a thorough site analysis should inform the placement of improvements on the site. Issues of security, fire management, erosion control and accessibility need to be addressed in this analysis phase.

This section provides supplemental information for:

Table XXX, A.2 Site Design/
Site Analysis
Fire
Erosion
Safety Hazard
Brownfields
Security

a. Site Analysis

Site analysis is the first step in site development planning. The analysis evaluates a proposed project in context with the physical and operational constraints of the site. A thorough site analysis identifies development potentials, restrictions and the supporting institutional investments that may be needed to meet a project's schedule and budget.

The site analysis can be depicted on a summary map or series of maps that present all development issues affecting the planning and construction of a project *(Figure XXX)*. The map should incorporate existing conditions data and long-range site development and infrastructure goals from the *Comprehensive Site Plan, Area Development Plans* and *Specific Area Master Plans*.

Include the following information in the analysis:

- topography / slope
- soil types
- vegetative cover
- geologic and seismic data
- adjacent land uses
- buildings and structures
- utility easements or corridors
- utility lines and sizes
- road system
- parking network
- pedestrian and bicycle networks
- transit network
- security improvements
- safety zones and buffers

Figure XXX: Example Site Analysis

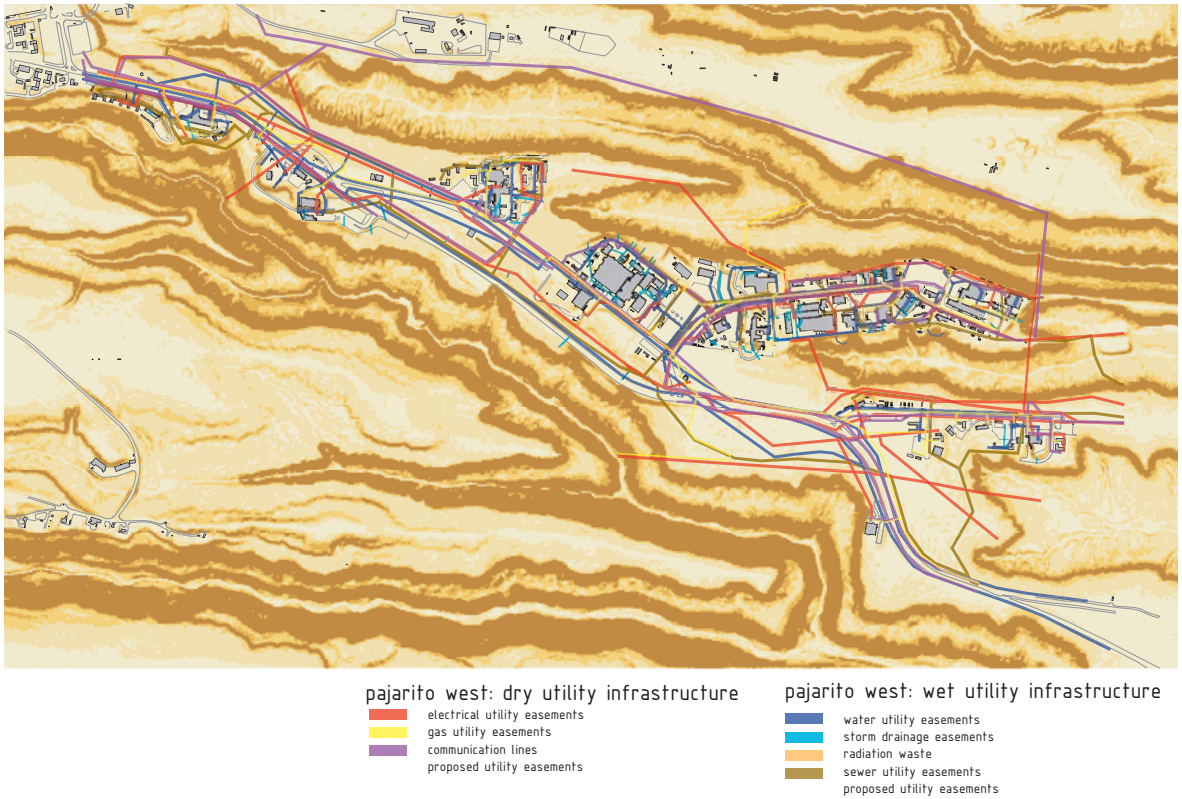
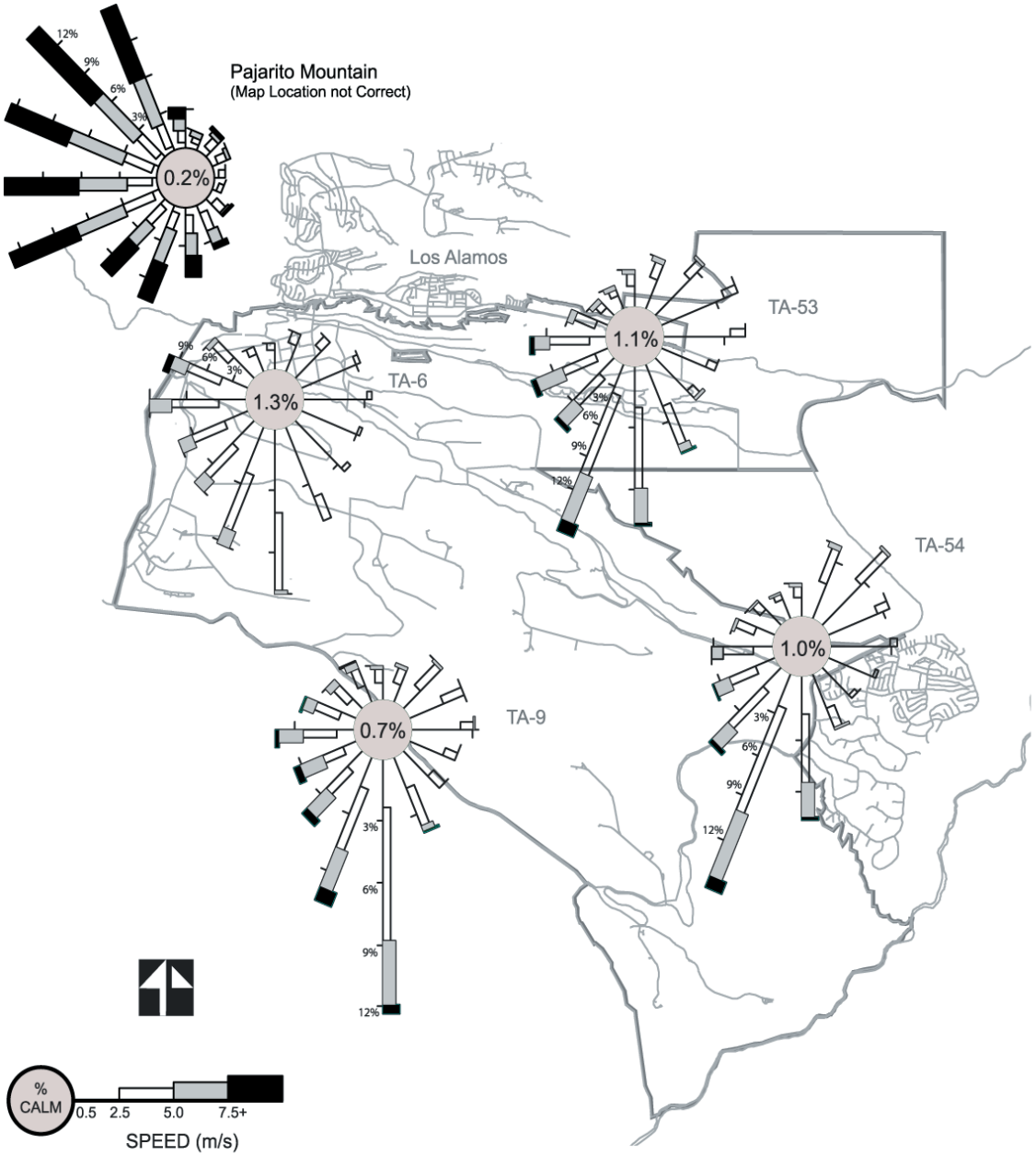


Figure XXX: Los Alamos Wind Conditions Summary 2000



Due to the Laboratory's location on the eastern slopes of the Jemez Mountain Range at the transition point of the mountain to the extended flat finger mesas, climatic conditions such as wind spped and direction, micro-climate mountain shading, etc. need to analyzed and considered in the early programming and design of a site. In particular, as the Laboratory developes more multi-story buildings, studies should be conducted of wind shear and wind tunnel effects from strong winds dropping down off the adjacent mountains and into the steep canyons below.

The Laboratory's location on the eastern face of the mountains creates site considerations for snow loads and winter shading affects. In particular, layout of circulation routes--vehicular, bicycle, and pedestrian--need to be studies for potentials for winter icing due to winter shading and effects created by cold air flowing toward the canyons.

Collect climatic information specific to the project site as part of site analysis:

- **wind rose**
- **temperature**
- **solar orientation**
- **micro-climate effects**

b. Fire Management Zones

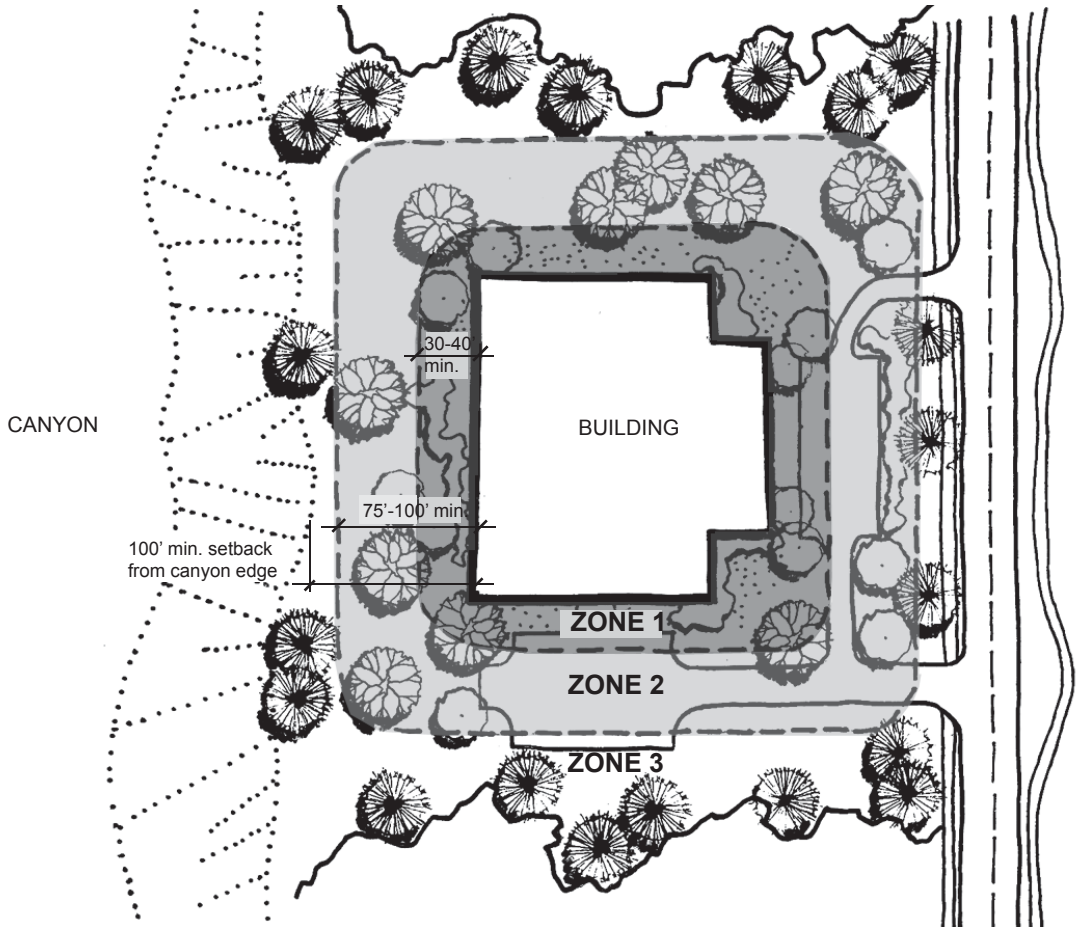
Recent fires at the Laboratory have emphasized the need for proper land use and site design to reduce risks from natural and man-made safety threats.

1) Fire Management Zones

Three fire management zones should be maintained around buildings in roughly concentric areas to reduce fire risks (*Figure XXX*).

Zone 1 is the main defensible space area. It is the area requiring maximum development modification and management. Its size depends on the structure size and the slope of the ground. Steeper slopes require larger defensible zones.

Zone 2 is a transition zone between Zones 1 and 3. Management of this area is less intense than Zone 1 and focuses on reducing fuels and undergrowth beneath trees. The distance measurements for Zone 2 are similar to Zone 1, but combined they should extend at least 75-100 ft. from the structure.



Zone 3 is an area of traditional forest management activities. The area extends from the outer edge of Zone 2 to the property boundaries. No specific size of zone is required.

2) General Fire Risk Reduction Guidelines

- Set back all new structures 100 ft. from canyon edges to create a fire safety break (*Figures XXX, XXX, and XXX).*
- Secure and hazardous facilities should have fire-retardant ground surfaces that extend 50 ft. from exterior walls of structures.
- Provide emergency and fire fighting access and improvements as required by the Laboratory.
- Provide space around buildings three stories and taller to position aerial fire apparatus (ladder, bucket, water tower, etc). The space should be on at least one side and preferably two sides of each building. The space should be parallel to walls with windows.
- Separate fire lanes/roads and buildings with a distance of 10 ft. minimum and 50 ft. maximum.

Figure XXX: Fire Setback Guidelines Sketch

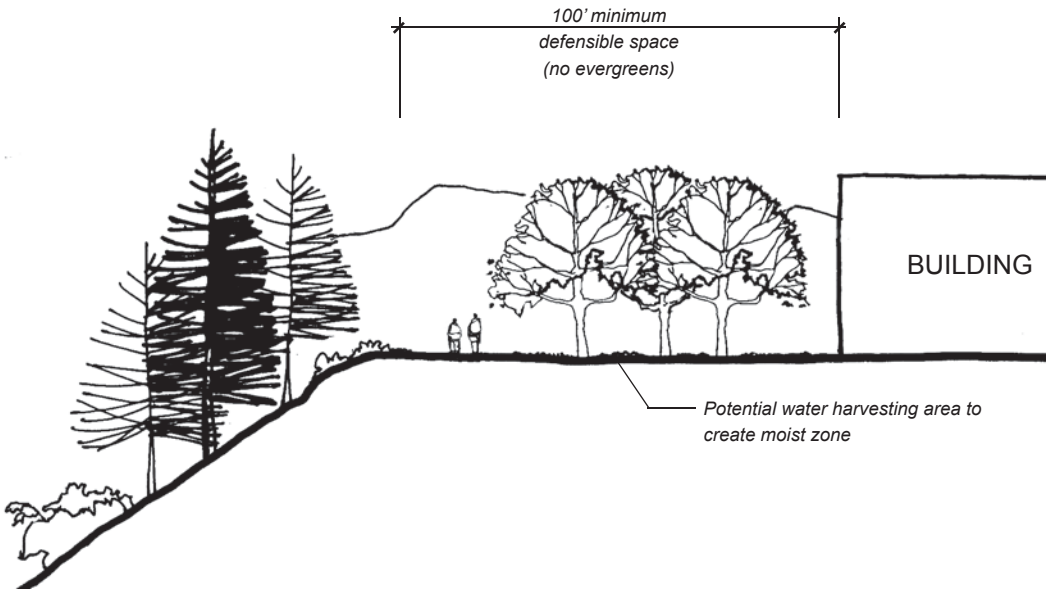
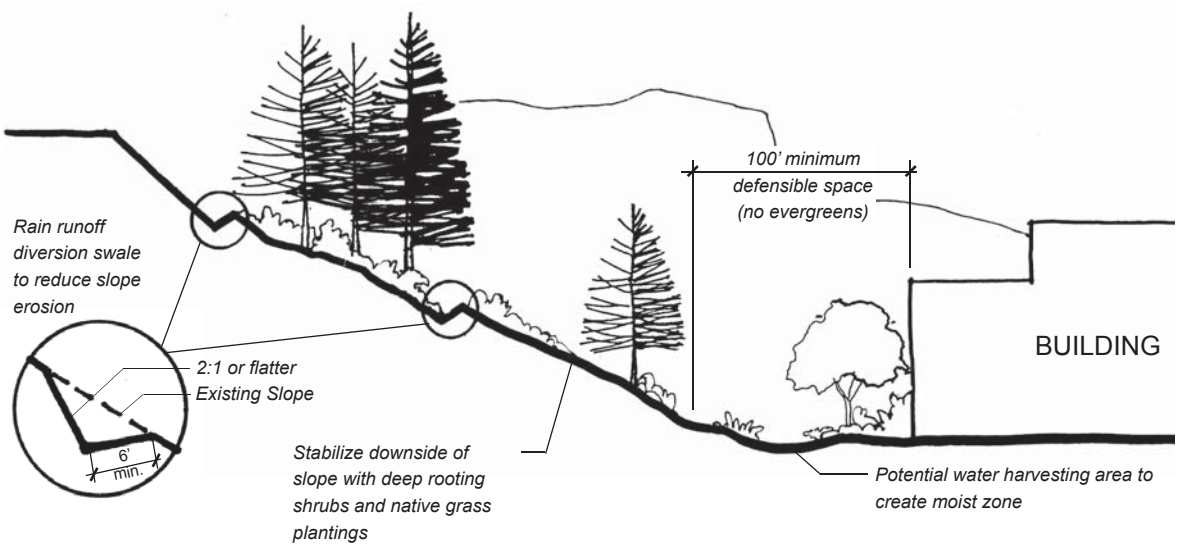


Figure XXX: Fire Setback Guidelines Sketch / Development in Canyons



3) Landscape Fire Risk Reduction Guidelines
Planting near structures should be selected based on fire-wise practices and consistent with the native environment.

- Install and maintain landscape improvements to allow passage around structures by the largest fire apparatus used by the Laboratory.
- Shrubs: Use low-growing shrubs to reduce the fire spreading potential. Specify non-resinous varieties when close to structures.
- Deciduous Trees: Use deciduous and ornamental trees in areas immediately adjacent to and between structures. Place native Aspen and Narrowleaf Cottonwood where sufficient soil moisture for healthy growth can be maintained.
- Evergreen Trees: Plant evergreen trees at a safe distance from structures. Prevent tree crowns from touching one another or buildings. Maintain a 5 to 10 ft. clearance between tree crowns at their mature spread.
- Prune trees to a bottom canopy height of about 8 ft. within Zone 1, gradually decreasing to a pruned bottom canopy of 5 ft. at the transition from Zone 2 to Zone 3.
- Beyond 75 ft. from structures, plant shade-tolerant native grasses under the forest trees to reduce ground fire potential.
- Setbacks and considerations for landscape development around structures on mesas and at the bottom of canyons or hillsides are illustrated in *Figures XXX* and *XXX*.

c. Flood Threat Reduction

Identify areas subject to flooding and develop measures to reduce or eliminate flood potential. Typical flood mitigation measures include:

- Removal and prevention of development in 100-year flood zones.
- Set back construction from edges of flood zones at least 25 ft.
- Construct flood diversion structures and improvements with new development.

No development of structures is allowed within 100 year flood zones.

d. Erosion Management Plan

As part of a comprehensive strategy to reduce erosion, new development shall not increase stormwater run-off rates. by properly detain and treat for water quaility on the project site.

Run-off water from hard surfaces such as roofs and paved areas has the potential to benefit landscaping and become a valuable resource rather than an infrastructural cost. Techniques for water harvesting are discussed in section XXX. Use water harvesting techniques in combination with erosion control techniques to manage storm water flows.

Figure XXX: Erosion Control - Straw Bale Barrier

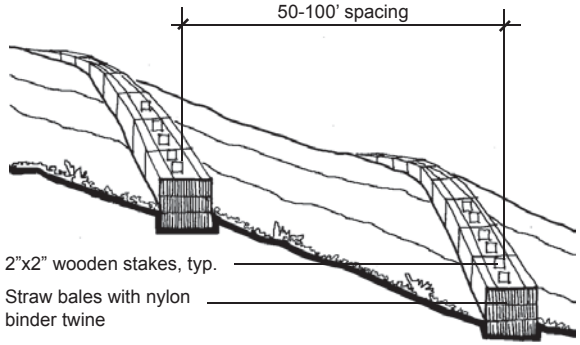


Figure XXX: Erosion Control - Bank Stabilization

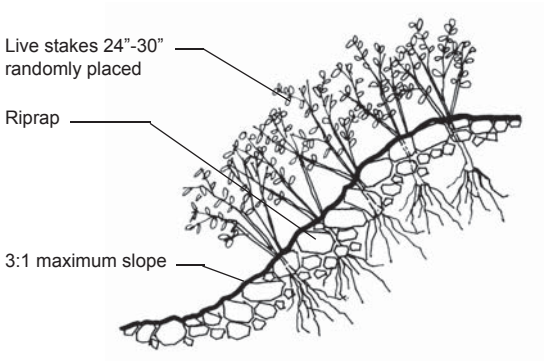


Figure XXX: Erosion Control - Check Dams

e. Safety Hazard Zones

Safety hazard zones are restricted areas around materials or activities that either need protection or that need to be protected from access or exposure by the public and non-authorized Laboratory staff. The zones can be applied to hazards from natural causes such as wildfires; as well as man-made causes such as toxic sites resulting from current or former Laboratory activities.

Safety hazard zones are usually physical spaces separating the particular hazard to be avoided or items to be protected. Techniques used to establish the zone can range from restrictions on development such as building setbacks from canyon edges to avoid wildfire encroachment or fences or walls to restrict access.

f. Brownfields Remediation

Brownfield sites are formerly used areas that have been polluted by any number of contaminants. These sites should be redeveloped whenever practical to avoid developing undisturbed land. In order to redevelop brownfield sites, all pollution needs to be remediated to ensure a safe environment. Depending on the type and extent of contamination, different techniques can be used to achieve remediation.

When a brownfield site is determined as the best location for development, a specialist should be brought in to determine feasability and develop a remediation plan.

g. Security

Security considerations are critical when siting new facilities or redeveloping existing sites.

Site development goals related to security are:

- Provide site improvements that are appropriate to the security needs of the project area and the health and safety of employees, the public and the environment.
- Provide security improvements that are aesthetically integrated into overall site development.
- Promote personnel security by providing well lighted, "defensible-space" site and building designs.
- Incorporate effective and efficient protection measures into the design programs for new development.

Specific security requirements are defined for every project. The following information identifies general security factors that affect site design.

1) Integrated Safeguards and Security Management (ISSM)

The Laboratory's Integrated Safeguards and Security Management (ISSM) emphasizes a Laboratory-wide security culture and enhanced security performance, and establishes a unified management model for achieving cost-effective operations. The goal of ISSM is to achieve excellent safety, health and environmental performance and to meet business imperatives without violating safeguards and security requirements. The *Design Principles* support the goals of ISSM.

2) Security Principles

The Laboratory's security principles are:

- Consolidate secure and hazardous functions and interests.
- Minimize public proximity to secure interests and safety areas.
- Limit public access to secure interests and safety areas.
- Enhance awareness of physical security and safeguard threats through education of all Laboratory personnel.

3) Security Siting Impacts

More restrictive levels of security have greater impacts on site planning. Security requirements affecting the site design can include:

- specific location within a planning area
- size of development site
- buffers and setbacks from structures,parking and circulation routes
- physical relationship of structures and facilities on site
- circulation for pedestrians, vehicles and emergency services
- perimeter fencing and access controls
- utility corridor location and protection
- redundancy of utility distribution and source
- design of buildings and structures
- security interest housed or contained in a facility
- terrain management and landscaping
- exterior lighting requirements
- exterior signage

4) Site Security Concept Description
Physical security is based on a "protection in-depth/graded protection" concept. This concept physically places the most important data, material, or persons in a highly controlled center surrounded by areas of decreasing levels of security. *Figure XXX* illustrates the concept for both nuclear materials and classified matter.

5) Security Designations / Locations
The level of security required for any project must be in compliance with the Safeguards and Security Division Security Plan. Overall site- wide security locations are shown on the Laboratory Security Plan *Figure XXX.*

6) Security Elements Siting Approval
Siting of control gates, fences and other physical barriers must be approved by the Security Strategic Planning Team of S-1.

Siting factors include:
- topography
- erosion and drainage
- disturbance to site by construction
- existing site functions
- maintenance requirements
- visual impact
- line of sight

Figure XXX: Site Security Concept

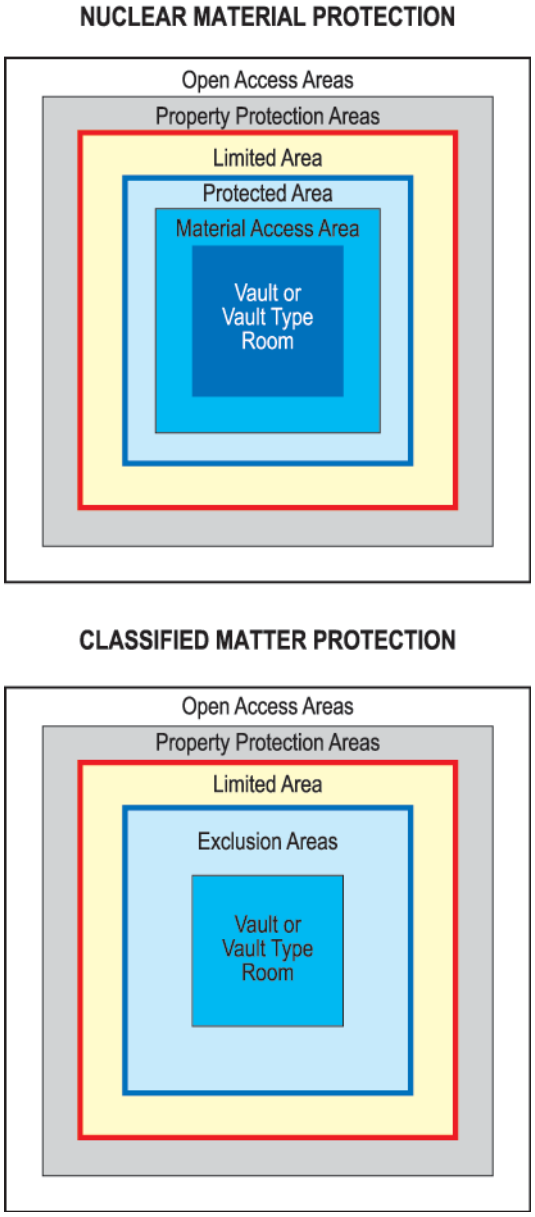
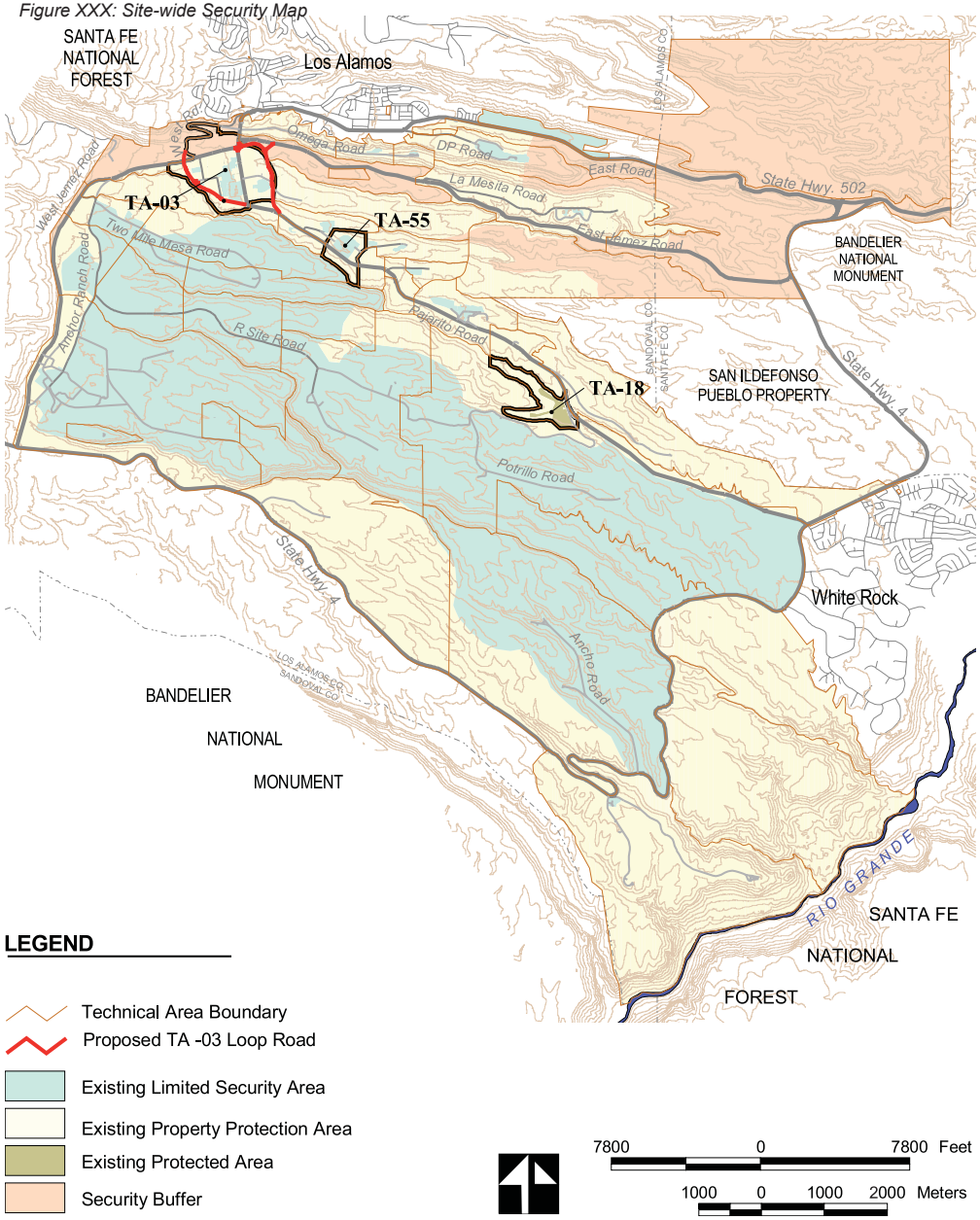


Figure XXX: Site-wide Security Map



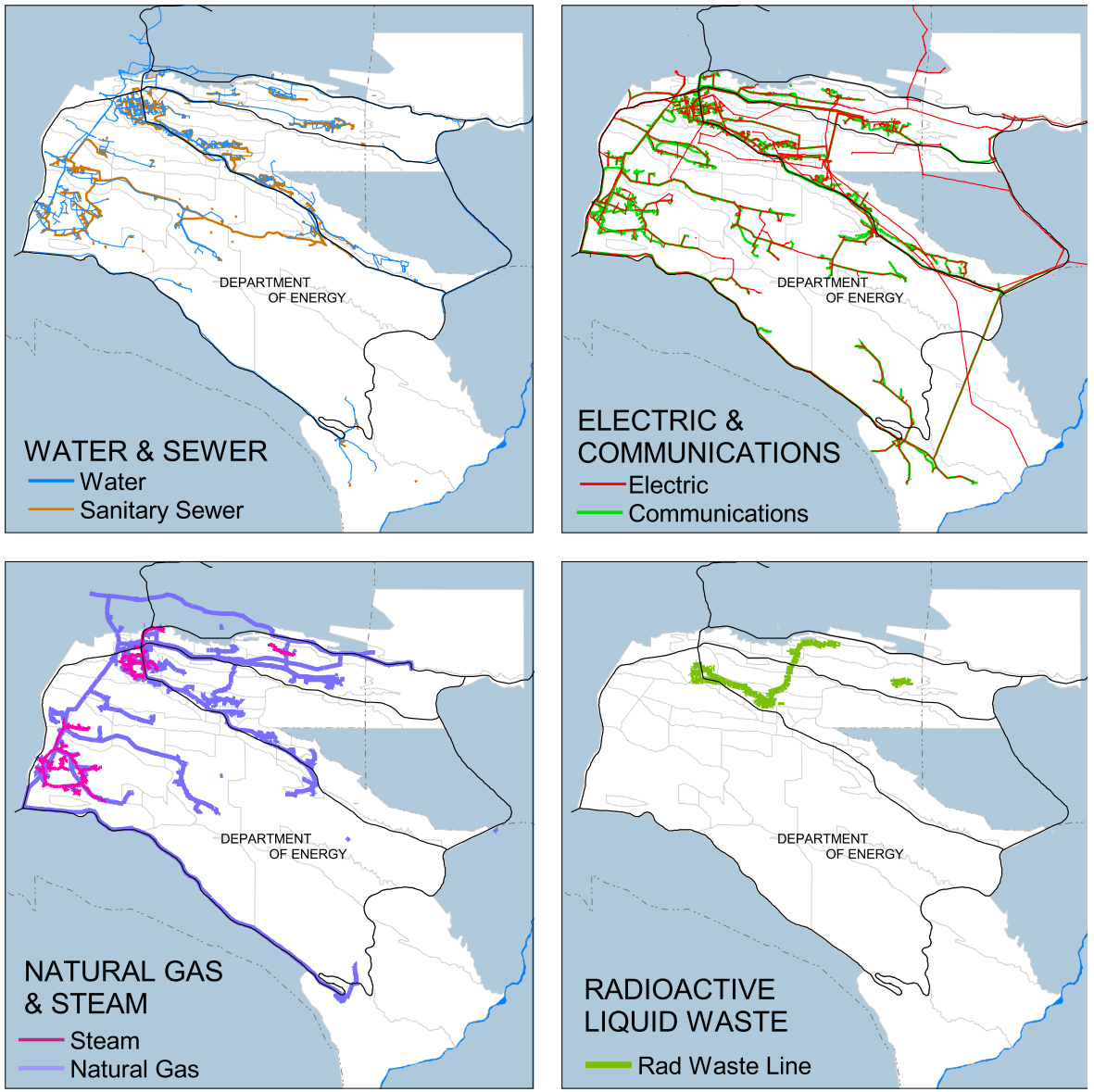
f. Utility Corridors

Utilities supply critical services such as water, power, natural gas, steam, sewage treatment, telephone and communications services, and stormwater runoff. Their development impacts all sites. With proper coordination and placement, utilities improvements can be visually compatible and contribute to an attractive Laboratory environment.

Guidelines

- Use utilities corridors identified in the CSP, ADPs and Specific Area Master Plans. *Figure XXX* shows site-wide corridors.
- Develop a long-range program to place selected above ground utilities underground. Priorities can be based on the benefits to be realized such as operational cost savings, safety, security and visual improvements. Placing utilities underground is a safeguard during potential fire events.
- Place utilities underground on new projects.
- Integrate utility development with the planning of future structures, roads and pedestrian walkways.

Figure XXX: Site Wide Utility Corridor Map



- Develop an organized system of utility locations for each project that anticipates and allows access for maintenance, periodic repair/upgrading, or replacement.
- When utilities are located above ground, reduce their visual impact by using non-reflective materials and screening with planting, walls or fencing.
- Locate above ground structures away from public view when possible.
- Place fire hydrants in clearly visible locations and maintain access to hydrants.
- Closely coordinate the placement of utilities within the streetscape to avoid conflicts. Plant materials, paving, site furnishings, signs and light fixtures should not complicate access for utility maint

Figure XXX: Urban Arterial - Utility Corridor Section

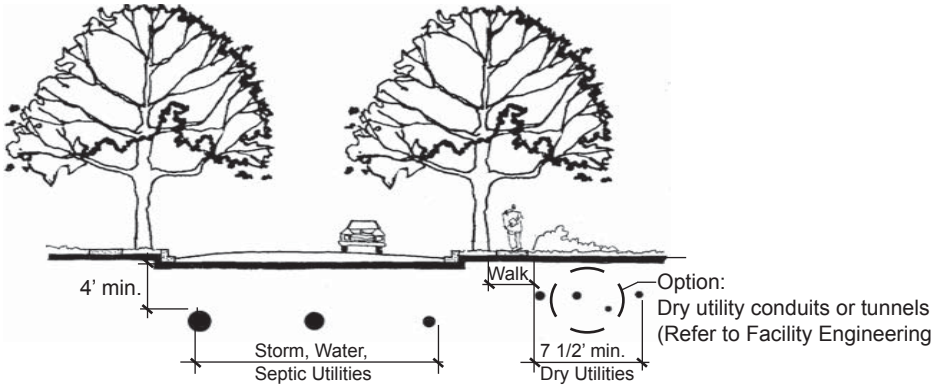


Figure XXX: Rural Arterial - Utility Corridor Section

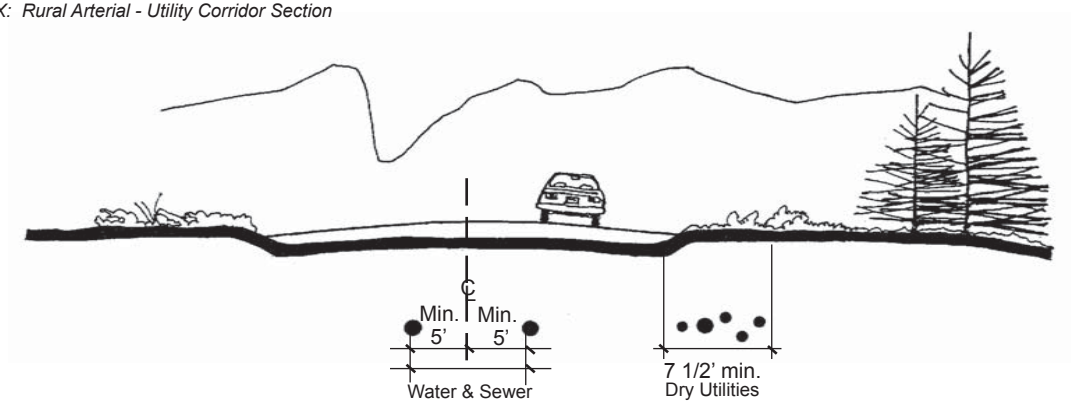
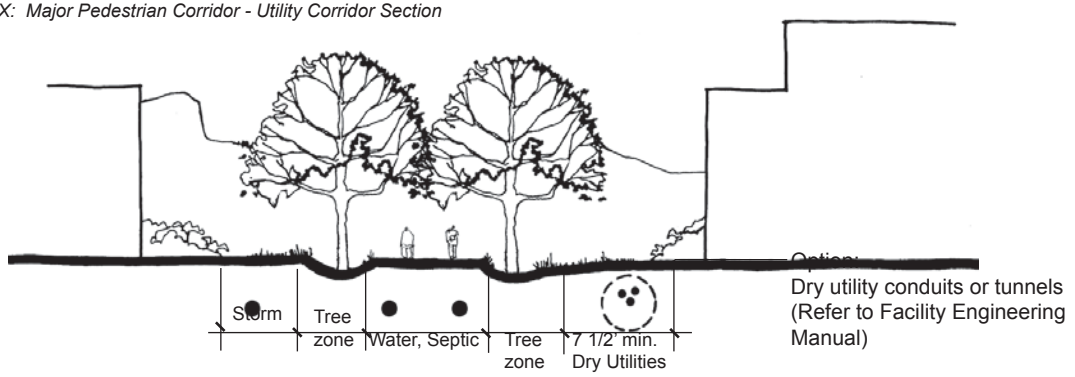


Figure XXX: Major Pedestrian Corridor - Utility Corridor Section



Energy and Water

Innovation to conserve energy and water resources benefits the Laboratory in multiple ways. It can reduce environmental damage, reduce dependence on fossil fuels, repair damaged or contaminated land. The following energy and water conservation strategies should be incorporated into development projects at the Laboratory as a commitment to be a leading world class research and science facility.

This section provides supplemental information for:

Table XXX, A.4 Site Design/
Energy and Water
Solar Orientation
Passive Heating
On-site Power
Renewable Energy
Water Harvesting
Greywater Reuse

a. Solar Orientation

Building siting should use solar orientation to:

- Set building orientations that increase human comfort and safety from sun, snow, rain and wind.
- Provide optimum internal building comfort and energy conservation *(Figures XXX, XXX and XXX).*

Additional siting considerations are:

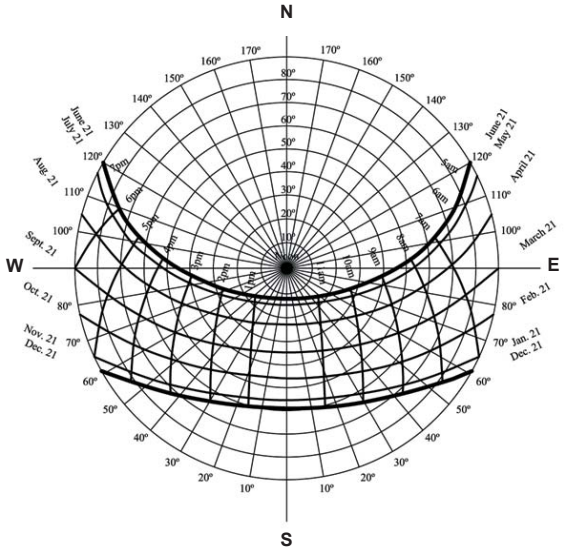
- Avoid restricting the solar access of neighboring structures in building design and orientation (*Figure XXX*).
- Design outdoor spaces between buildings to take advantage of winter sun and summer shade.
- Create buffers using landforms, structures and plants to mitigate summer heat gain, glare and winds (*Figure XXX*).
- Consider orienting when appropriate to prominent views of the mountains and the Rio Grande Valley in building siting and design.

b. Passive Heating and Cooling

Building designers should use solar "direct gain" analysis as an evaluation tool in order to:

- Control solar heat gain on building surfaces (*Figures XXX, XXX* and *XXX*).
- Control and direct sunlight for interior building daylighting as well as passive heating and cooling opportunities.

Figure XXX: Sun Angle Diagram 36 North Latitude



36° NORTH LATITUDE
SUN ANGLE DIAGRAM

Figure XXX: Optimum Solar Orientation - Los Alamos

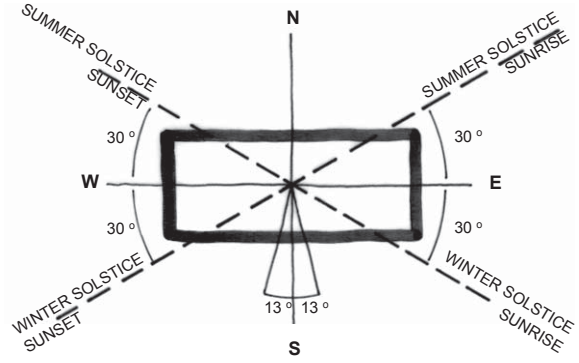
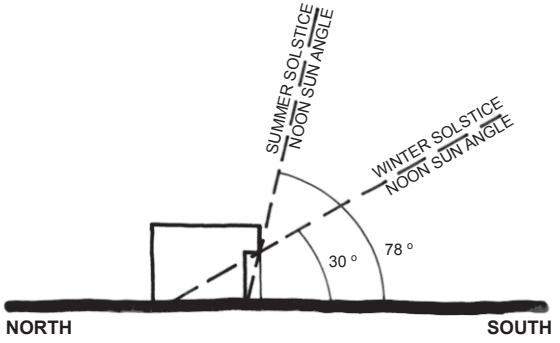


Figure XXX: Solar Sun Angles - Los Alamos

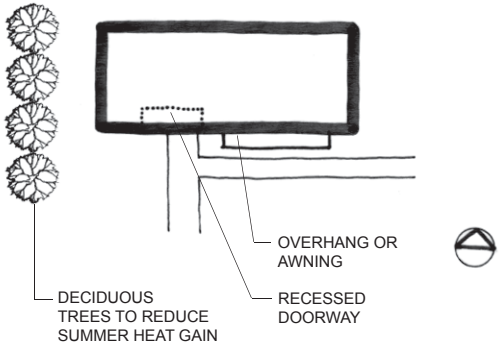


c. On-Site Power Generation

Reducing the reliance on large-scale regional energy systems is important to help achieve energy independence goals of the federal government. Various technologies such as bio-generation, photovoltaics, wind and geo-thermal can effectively generate power on-site. Opportunities for on-site power generation should be explored on every project, but in particular, by projects that are remote from existing power and energy systems.

Alternative generation technologies being developed at the Laboratory provides a unique opportunity to implement and test these new technologies.

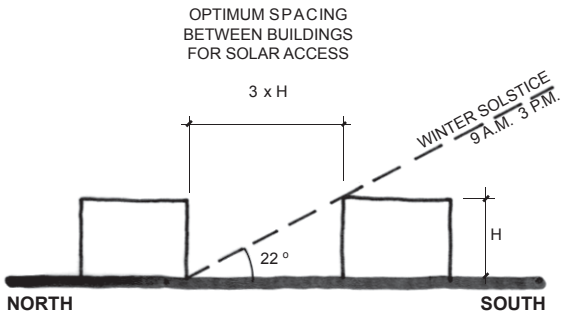
Figure XXX: Methods To Reduce Summer Solar Gain



d. Use Renewable Energy Sources

When it is not possible nor feasible to generate power on-site, energy needs should be obtained from renewable energy sources. Energy from renewable sources, such as wind or geothermal, maybe be options available from Laboratory power facilities or from the local energy supplier.

Figure XXX: Building Spacing for Solar Gain - Los Alamos



g. Water Quality

Water quality protection deals with both maintaining and improving the quality of water in the natural environment and as a source for potable water.

Specific water quality requirements will be developed for projects by ESH. General guidance to protect water quality include:

- Identify water pollution sources from development and operation of the site. Common site development sources of water pollution are:
  - runoff from parking lots and roads
  - concentrated rainwater runoff
  - pesticide, herbicide and fertilizer use
  - road and walkways de-icing activities
  - construction debris and materials
- Create prevention, mitigation and/or management plans for each water pollution source.
- Use best management practices to address water quality problems. A partial list of method for addressing water quality problems are:
  - constructed wetlands
  - water quality ponds and channels
  - erosion control measures
  - terrain management measures

d. Water Harvesting

Harvestng storm run off to supplement landscape irrigation to plant materials is an effective way to reduce the use of potable water. Parking areas should be designed to capture harvested water into medians and small catchment locatios to support shade trees that help reduce heat island effects of parking lots. Water harvesting shall be designed as part of the overall stromwater management plan for a site.

e. Greywater Reuse

Grey water from on-site facilities can be captured, cleaned and re-used for irrigation. This strategy greatly reduces dependence on potable water for landscape uses a goal in the arid environment in which the Laboratory is located. To implement a grey water re-use system, a specialist should be consulted to develop a project specific design.

Urban Open Space

Creating safe, functional and attractive outdoor spaces is an important function of site design. Well-designed urban open spaces contributes to the health, safety, and well being of staff and visitors. And provides appropriate locations for emergency refuge.

This section provides supplemental information for:

Table XXX, A.3 Site Design/
Urban Open Space
Entry Area
Outdoor Seating
Utility Corridors

Plazas, courtyards, outdoor seating areas and entry ways that make up the urban open spaces that are part of the Laboratory pedestrian system. Here people walk, talk, rest, and enjoy the each other and the outdoors. Human use and comfort should be the focus of urban open space.

The aesthetic quality of plazas and courtyards is important. Visitors and staff use these spaces on a regular basis. Well designed visually pleasing plazas and courtyards encourage greater use and improve the Laboratory's work environment.

a. Plazas

Pedestrian plazas are large public outdoor spaces serving a complex of heavily used or public access buildings, A plaza is to accommodate large scale movement of people between buildings and as emergency access, security buffer, and utility access for the adjacent buildings. Plazas are unique improvements at the Laboratory. Evaluate the Area Development Plan or Specific Site Master Plans in which the project is located to determine if one is required. A thorough site analysis shall be part of the design process. *(See the below example.)*

Figure XXX: Plaza Design - Example Site Analysis

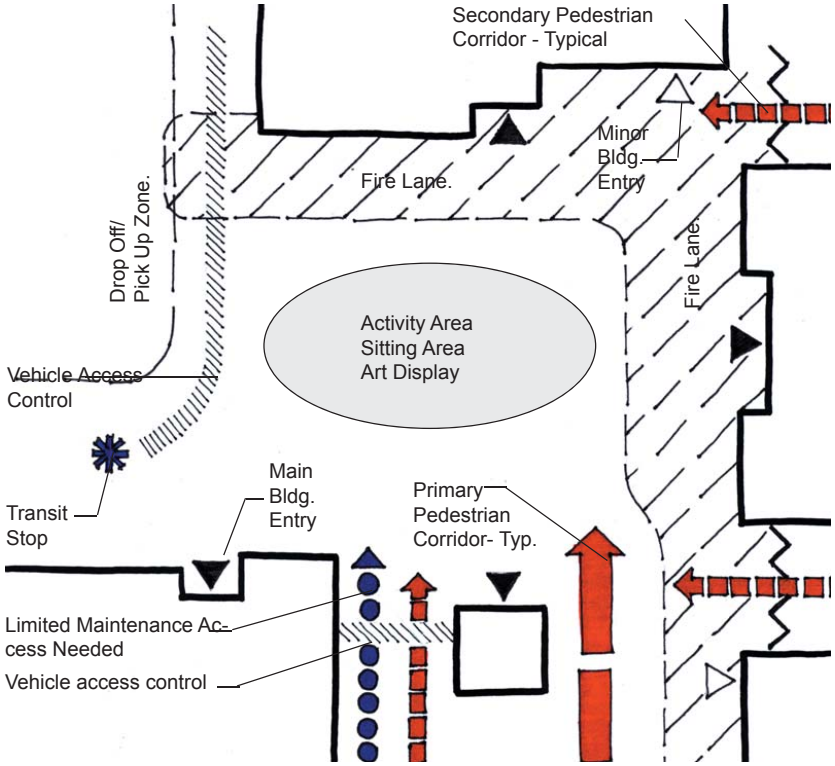
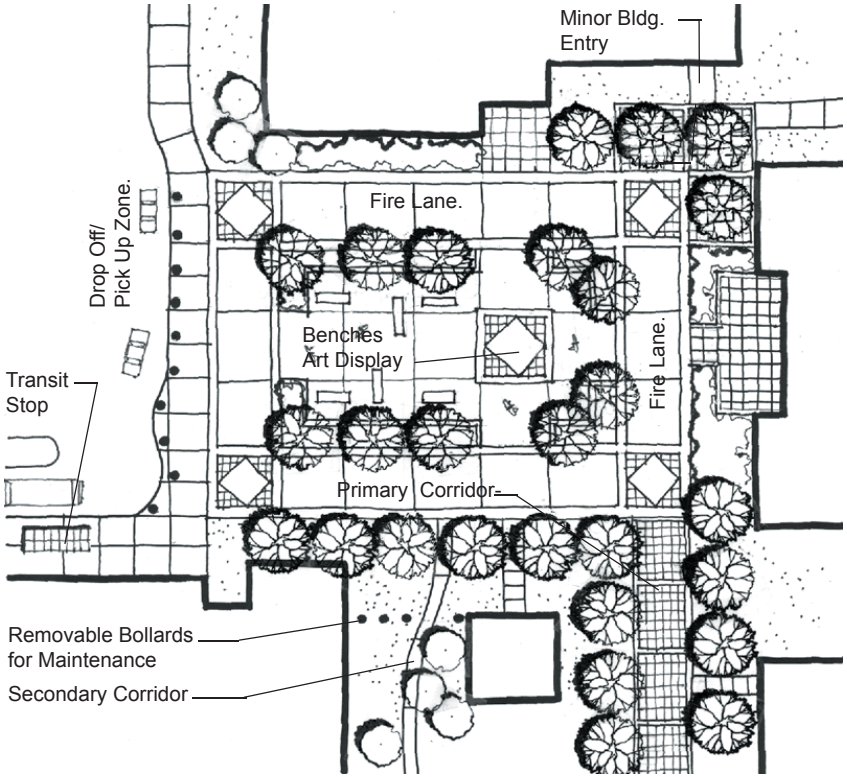


Figure XXX: Plaza Design - Schematic Plan



Locate plazas as indicated on the ADPs and specific area master plans in relationship to safety refuge needs.

- Large plazas may have special features such as an amphitheater.
- Use specialty paving materials to define and organize spaces within the plaza.
- Accommodate emergency, security, utility, and maintenance needs as appropriate.
- Building entry courtyards should provide a clear pedestrian access route from the parking area to the main door of the building.
- Courtyards should link with nearby pedestrian corridors, sidewalks and parking.
- Locate bicycle racks, trees and other pedestrian amenities at least 15 ft. from building entrances and walls.
- Include building identification signage as part of courtyard design.
- Create a drop-off and pick-up location near entry courtyards for shuttle vans and transit vehicles.
- Maintain a 20 ft. clear horizontal width on all emergency access routes within plazas. and a 16 ft. minimum vertical clearance over emergency lanes within plazas.
- Include areas to accommodate snow removal storage in Plaza designs.
- Control access to plazas with breakaway or removable bollards.

b. Entrance Areas

The entry to a building is to be a focus for improving the urban open spaces at the Laboratory. The following are the required improvements at entries to buildings. *(See Figures XXX and XXX)*

Entrance Area Requirements:

• Minimum 6 foot wide accessible walk to main entry of building
• 10 sq.ft. hardscape per occupant (min. 500 sq.ft.)
• 2 Benches
• 1 trash receptacle
• 1 Cigarette Receptacle
• 1 bike rack (3 bike) per 25 occupants (min. 1)
• 10 sq. ft. of planting area per occupant (min.500 sq.ft.)

c. Outdoor Seating/Break/ Smoking Area

Outdoor seating, break and smoking areas provide places for a variety of formal and informal events and functions. Microclimate considerations are an important factor in human comfort in these exterior plazas and courtyards. These areas are used on a daily basis for the small-scale personal interactions that make a workplace productive.

Outdoor Seating/Break/Smoking Area Requirements

• Outdoor Seating/Break/Smoking Area to occupied buildings with 25 people or more
• 10 sq.ft. hardscape per occupant (min. 500 sq.ft.)
• 2 Benches per 25 occupants
• 1 trash receptacle per 25 occupants
• 1 Cigarette Receptacle per 25 occupants
• 10 sq. ft. of planting area per occupant.

Figure XXX: Courtyard Design - Example Site Analysis

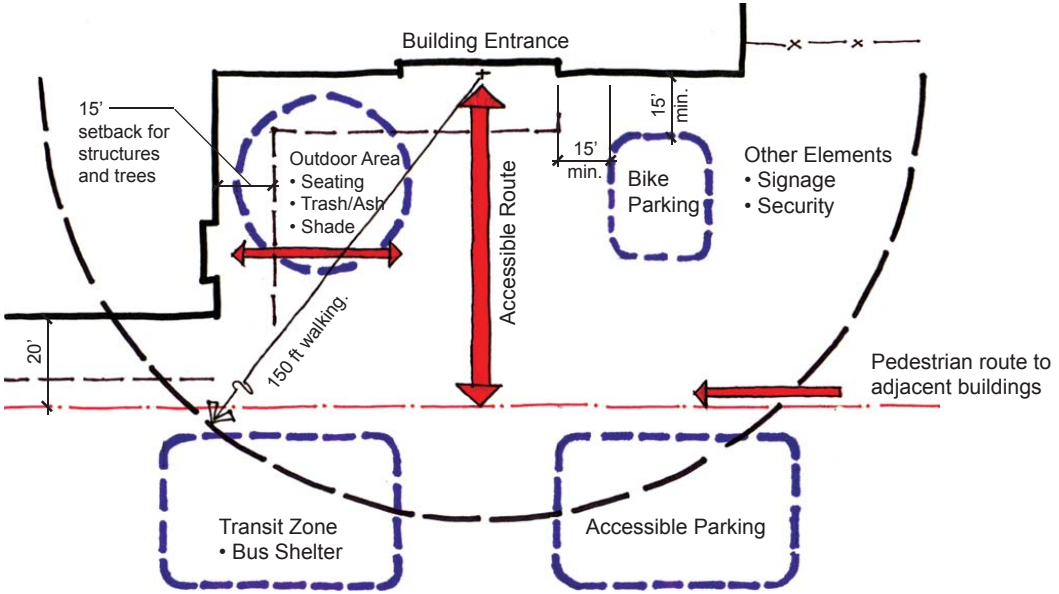
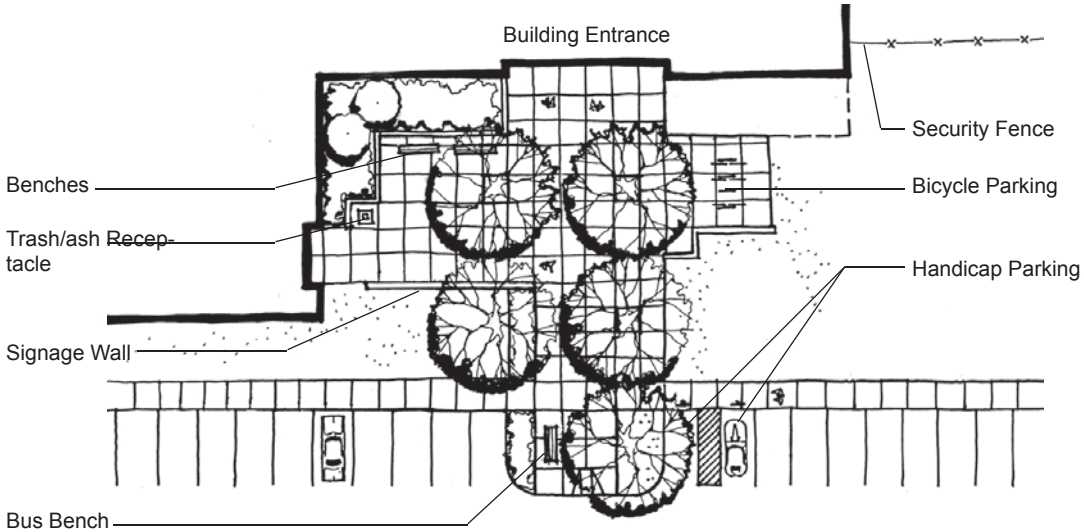


Figure XXX: Courtyard Design Recommendations - Plan



d. Acessibility

Sites shall be designed to:

- Provide accessible routes for pedestrian that connect buildings to roadways, parking areas, walkways and trails.
- Separate service and maintenance access from primary pedestrian routes and areas.
- Meet the guidelines for accessibility established in the Americans with Disabilities Act (ADA) and Uniform Federal Accessibility Standards (UFAS).

e. Emergency Egress and Access

Sites shall be designed to:

- Provide emergency egress route for all emergency exits from buildings.
- Provide access for emergency and fire equipment around structures,
- Coordinate emergency routes with the pedestrian circulation system for the area as defined by the Area Development Plan or Specific Master Plan in which the site is located.
- Meet the emergency access requirements as contained in the Engineering Standards Manuals.

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f. Emergency Refuge Locations

Sites should be designed to:

- Provide an emergency refuge location as defined by ESH.
- Coordinate emergency refuge locations with plazas, courtyards and outdoor urban open space as defined by the Area Development Plan or Specific Master Plan in which the site is located.
- Meet emergency refuge requirements as contained in the Engineering Standards Manuals.